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U.S. Agricultural Marketing Service
Grain Division, Seed Branch
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X SPACE, SERVICE REQUIREMENTS, EQUIPMENT, AND SUPPLIES FOR A SMALL SEED-
TESTING LABORATORY X

I. Space and Service Requirements

1. Space

Laboratory

At least 1,000 sq. ft. floor space preferably arranged into rooms.

Office

Space as required depending on circumstances.

2. Location and Exposure

Location within a city is not particularly important, provided the laboratory receives ample daylight. A ground floor location is usually desirable but not necessary if elevator service is provided. At least 1/5 to 1/4 of wall area should be windows. Half the laboratory space should have a northern exposure with windows.

3. Laboratory Services

Wall plugs for electrical outlets, 110 volts, alternating, 60-cycle current are necessary. Lines should carry current for four $\frac{1}{2}$ H.P. and two $\frac{1}{4}$ H. P. motors, and thirty to fifty 50-watt lamps or equivalent. Running hot and cold water, sink and drainage are required. Vacuum (minimum of 25 inches mercury) and air pressure (20 pounds per square inch) are desirable but not necessary. If vacuum is available, the vacuum pump in the following list can be omitted. It is desirable to have a corner of one room equipped with a chemical laboratory fume hood with exhaust fan.

4. Storage Space

Approximately 3,000 cu. ft. of storage space (60° F.) adjacent to or near the laboratory should also be provided. It is also desirable to have about 1,000 cu. ft. of storage space refrigerated to 40° to 50° F.

5. Greenhouse

Greenhouse space, conveniently located to the laboratory, is highly desirable. It is frequently necessary to make greenhouse tests on some samples of questionable quality in order to check the laboratory results.

6. Pasteurized or Sterilized Soil and Sand

It is desirable to have a source from which sterile soil and sand can be obtained. If this service is available, the soil sterilizer can be omitted from the following list.

II. Equipment and Supplies for Purity Laboratory

1. Equipment:

Balances

- 1 Chain-O-Matic or semi-automatic balance with 25-gram pan and counter balance, and weights--1 balance for each 2 purity analysts.
- 1 Heavy-duty balance and weights--sensitive to 1/20 gram.
- 1 Torsion balance and weights--sensitive to 2 milligrams.
- 1 Toledo scale--Computagram type (desirable).

Bell jars

- 1 large (8-10 inches in diameter))
 - 1 small (4-5 inches in diameter))
-) per purity analyst.

Plastic covers can be used instead of bell jars.

Blowers

- 1 Iowa or Ottawa seed blower if small grasses are to be tested.
- 1 South Dakota blower for larger seeds (desirable).
- 1 Air blast to clean dividers.

Purity work boards

- 1 per purity analyst.

Bookcase

At least 2 to 5 sections, depending on size of library.

Cabinets

- 1 storage cabinet 33" x 17" x 6' steel.

Calculating machine (automatic for division and multiplication)

Chairs

- 4 or 5 adjustable height and back rest with casters (Steel stenographer's chairs are satisfactory)

Dishes

- 2 doz. small Petri dishes-- 50 mm. in diameter.
- 1 doz. large Petri dishes--100 mm. in diameter.

Desk

Seed dividers or samplers

1 large Boerner and 1 small Boerner divider, or 1 Gamet divider.

Fluorescent lamps (daylight tubes)

20 volt with double tubes--2 table type and 2 desk type individual and adjustable in all directions such as Dazor floating lamp--1 per analyst.

Forceps

$\frac{1}{2}$ doz.--sharp-pointed and sensitive to the touch.

Seed collection (including cases, samples, and index for cataloging)

Herbarium should contain samples of species and cultivated varieties of crops and species of weeds with which analysts work.

Magnifiers

1 6X or 7X triplet)
) per analyst
1 9X or 10X triplet)

Reading glass on stand

1 per analyst (desirable).

Microscopes

1 stereoscopic binocular dissecting type with 6 magnifications ranging from approximately 10X to 150X.

1 compound monocular type with low power, high power, and oil immersion objectives.

Scalpels

1 per analyst.

Seed pans

Triangular; 10 to 20 of assorted sizes.

Sieves

Round brass dodder sieves with holes from 0.508 to 3.505 mm.

1 Johnson grass sieve.

1 Beet sieve 7/64 inch.

1 Set dockage grain sieves--sizes selected to meet local needs.

Other sieves as needed.

Tables

- 1 desk or small table with drawers for each purity analyst.
- 1 30-inch and 1 36-inch table for dividers, samples, and scales.
- 1 stone top balance table for each analytical balance.

Diaphanoscope

1 good diaphanoscope that gives a strong beam of light without glare in the eyes.

2. Supplies:

Bolting silk

1 yard for glass blowers, if needed (depends on type of blower used).

Capsules (gelatin)

10,000 large.

10,000 small.

Cards

Laboratory record cards for purity and germination.

Envelopes

20,000 for purity separations.

5,000 for bulk samples.

Paper

For purity workboard and arm rest--treated to prevent glare--1 ream-- (aquamarine color is desirable).

Notebooks, workbooks, etc.

Report forms

For reporting results of tests.

Vials with corks

50 gross small shell vials (including needs for seed collection).

1 gross 50-gram size.

III. Equipment and Supplies for Germination Laboratory

1. Equipment:

Chairs

1 per analyst--Same type as specified for purity analysts.

Tables

2 long or 4 small tables, preferably with a few drawers for pencils, etc.

Fluorescent lamps and filters (for determining the fluorescence of ryegrass seed

1 ultra-violet lamp with filter enclosed in appropriate dark cabinet or closet. Examples of equipment--EH4 mercury lamp and No. 584 Red ultra filter with maximum transmission at 3650 AU.

Certain other types of lamps are acceptable. See Association of Official Seed Analysts Proceedings for 1949, pages 89-92.

Forceps

$\frac{1}{2}$ dozen--Blunt pointed, flexible type.

Magnifiers

Each germination analyst should have a 6X or 7X triplet magnifier. Germination analysts should have access to the dissecting and compound microscopes listed under equipment for purity analysts.

Germination chambers

The temperatures needed in any laboratory will be determined, to some extent, by the kinds of seeds to be tested. The following provide a good range of temperatures: 10° C. constant, 15°-25° alternating, 20° constant, 20°-30° alternating, 20°-35° alternating, 30° alternating, 30° daylight, 35° daylight. The amount of space required at any temperature will vary with the amount and kind of seed to be tested. Ordinarily, only a single dark chamber will be required at the following temperatures: 10° C., 15°, 25°. At 30° and 35° both dark and daylight germinators are necessary. Ordinarily, more space is needed at 20° than at any other temperature. The 20° C. chambers can all be dark, but this is not necessary.

Many seeds need to be subjected to alternating temperatures during germination. There are two methods of doing this as follows: (a) Having enough chamber space so the seed trays can be transferred manually from one chamber to another; (b) alternating the temperature within the chamber. In the latter instance the temperature should be alternated within a period of 30 minutes without unduly drying the test material. This method has the advantage of economizing on space and saves labor, but it is difficult to obtain the desired temperature alternations without drying.

Most tests are made at a constant temperature of 20° C. and alternating temperatures of 20° to 30°. Each laboratory should have facilities for pre-chilling at 10°, have daylight germinators that can be held at 30°, and/or 35° C. depending on local needs and access to a greenhouse for check testing.

Glassware

Petri dishes

10 to 30 dozen 100 mm. Petri dishes--plastic dishes may be substituted.
5 to 15 dozen 120 mm. Petri dishes.

Bottles for soaking beet seeds--1 to 4 dozen depending on needs.

Beakers-- $\frac{1}{2}$ dozen of assorted sizes--copper or aluminium preferred.

Burettes for measuring water for sand tests (1 500 cc. capacity and 1 50 cc. capacity).

Two liter flasks for making up potassium nitrate solution.

Moisture testing facilities (if this service is to be performed).

Florists' sprinklers bulbs

1 dozen.

Seed cabinets

2 steel storage cabinets 33" x 17" x 6" (for holding germination supplies).

Seed counters

Vacuum pump with plates of varying sizes, shapes, size of holes, and number of holes to take care of local needs. See page 25 of "Manual for Testing Agricultural and Vegetable Seeds," USDA Handbook No. 30. At least two hose outlets for the counting attachments should be provided. Size of pump will be determined by size of seeds to be counted, number of outlets needed, and whether direct acting or acting on a vacuum tank.

Sand testing equipment

Either a soil or sand sterilizer or access to a supply of sterilized sand and soil is desirable.

Either 3 galvanized containers for storing sand and soil or 2 built-in bins.

2 flat mixing pans for sand and soil.

1 large sieve-- $\frac{1}{2}$ inch openings--For first sieving.

1 large sieve-- $\frac{1}{4}$ inch openings--For final sieving.

2 flat strokers--To stroke off sand evenly.

Thermometers

1 dozen chemical thermometers--Scale 0 to 100° C.

1 seven-day self-recording thermometer (desirable).

1, 24-hour self-recording thermometer (desirable).

2. Supplies:

Filter paper (for fluorescence tests only)

9 $\frac{1}{2}$ " x 9" square or other sizes to conform to equipment and practices used locally. The paper should be checked against chemically pure paper to determine whether or not it is satisfactory.

Seed germination blotters

Gray or dark blue--cut to sizes 6" x 9 $\frac{1}{2}$ " and 9 $\frac{1}{2}$ " x 9" (the 6" x 9 $\frac{1}{2}$ " blotters are used for folded blotters, and the 9 $\frac{1}{2}$ " x 9" size is used for fluorescence tests and for cutting circles for Petri dish tests).

Paper toweling (for germination tests)

Brown mosinee (11" x 13").

Waxed paper (butchers)

12" wide--Not always necessary.

Waxed or paraffined boxes (for sand germination tests)

1,000 to 2,000 size 7 $\frac{1}{2}$ " x 8 $\frac{1}{2}$ " x 1 $\frac{3}{8}$ ".

500 to 1,000 size 12" x 12" x 1 $\frac{1}{2}$ ".

Aluminum pans can be used instead of the waxed cardboard boxes.

Potassium nitrate (finely crushed)

1 bottle, A.C.S. grade.

1 stapling machine

Used for stapling sand boxes (foot-treadle type preferred, but small hand type can be used).

Rubber bands

1 dozen $\frac{1}{2}$ -pound boxes, size 18.

1 wire strainer

Size of a small vegetable strainer (used to pour water off soaked beets).

Distilled water

1 desk calendar (with ample space on which to write sample numbers)

Eyedroppers (for remoistening blotters in Petri dishes)

1 large crock (for wetting blotters and towels)

1 small filing box (for current file on 5" x 7" cards for samples in test)

1 dozen red wax pencils

1 dozen white pencils

2 dozen indelible pencils

2 dozen regular black lead pencils

Rubber stamps

1 set for stamping temperatures, etc., on cards.

1 date stamper.

1 bolt of cheesecloth

1 electric calculating machine (1 for entire laboratory is usually sufficient)

Adequate rodent-proof storage facilities (for file samples)

V. Books, Plates, and Other Publications

1. Testing Agricultural and Vegetable Seeds, U. S. Dept. Agr. Handbook No. 30, 441 pp., 1952.
2. Seed Analysis by Duane Isely, Iowa State College. 1954.
3. Rules for Testing Seeds, Association of Official Seed Analysts and U. S. Department of Agriculture.
4. Complete set of United States Department of Agriculture plates of seeds for identification.
5. Complete set of United States Department of Agriculture plates of seedlings showing normal and abnormal seedlings.
6. Set of Association of Official Seed Analysts Proceedings.
7. Set of Contributions to Handbook, AOSA.
8. Current seed trade journals.
9. File of Experiment Station and U. S. Dept. Agr. bulletins and circulars pertinent to crops to be tested.
10. Reference books in plant taxonomy.
11. Reference books in agronomy.
12. Reference books in horticulture.
13. Information on varieties of crops that will be tested.
14. Information on physiology of seeds, flower seeds, tree seeds.
15. Information on plant diseases, particularly those which are seed-borne.



